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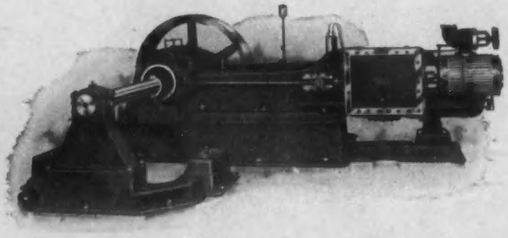

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JOURNAL OF ELECTRICITY
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VOLUME XXIII. SAN FRANCISCO, SEPTEMBER 11, 1909 NUMBER 11

THE ELECTRIC VEHICLE AS A CORRECTIVE FOR POOR LOAD FACTOR.[1]

The Electric Pleasure Vehicle

The advantages of a high load factor are so manifest as to require no discussion. The dream of the central station man is a load factor of 100% and during the last ten years great advances have been made in methods of attaining this ideal. The use of household labor savers, such as flat irons, vacuum cleaners, sewing machine motors, fans and cooking devices, dependent upon electric current as their source of power, has increased the demand for electric current during the day, when formerly there was little demand for current for any domestic purpose other than lighting. Perhaps the greatest increase in the day load for the central station has been due to the installation of motors for industrial purposes, thus replacing prime movers, such

[1]Paper read by W. J. Grambs at Convention N. W. Electric Light and Power Association, Seattle, September 7, 8, 9, 1909.

as steam and gas engines, and although the time of demand for power by these industrial motors during the winter overlaps the time of demand for lighting current, thus increasing to a degree the peak load, yet the total load factor has been greatly increased by their installation. Some service requires power during the entire twenty-four hours, but there are so few customers who can use power at 100% load factor that there yet remains great opportunity for improvement. From midnight to dawn there is little demand for electric power from the central station. How can a demand for power during those hours be created, thus making it possible for the revenue of the central station to be increased without in any way increasing the investment and at the same time increasing the operating costs but little?

The importance of accomplishing this result is apparent, either in the case of water or steam, as a source of power, although in the case of water power it is of more importance. The generation of power by falling water requires a large initial investment with correspondingly high fixed charges as compared to the initial investment and fixed charges of a steam plant. The hydro-electric plant has a compensating smaller operating cost as compared with a steam plant.

Horses for drawing cars have practically disappeared but the great bulk of transportation on our city streets is still done by this means. The power so consumed is enormous. Unfortunately we have no exact figures giving the amount of power demanded for this purpose, but suffice it to say that if horsepower were supplanted by electric power that could be furnished between the hours of 12:00 at night and 6:00 in the morning, the load factors of the central stations would be greatly improved and their revenue accordingly increased.

The electric vehicle makes it possible for the power company to choose the time for furnishing power for transportation on our city streets. If the customer is given an opportunity of using current at any time in connection with his electric vehicle business, he will probably be careless of the method best suited to the interests of the power company and use current in such a manner that the load factor would not be increased as desired, but if the central station makes a rate dependent upon the time during which the power is used, thus penalizing the customer for the use of power during the peak, the greater number of customers, and especially those using the power for commercial purposes, will see to it that their interests are properly served and thereby the interests of the power company are also best served. In other words, the electric vehicle can be made the means of establishing a load, not for 24 hours but better still for that part of the twenty-four hours when it is most desirable for the central station company to furnish it. By the use of the electric vehicle your customers purchase batteries to take the load off the peak indirectly by filling in that portion of the time when there is small demand for power of any kind. Power companies build great storage reservoirs and purchase storage batteries to increase the load factor. Here is an opportunity for increasing the load factor without increasing the investment, but simply by introducing the use of a device which it has been demonstrated will prove of great benefit not only to yourselves but to all those living in congested districts of large cities.

The electric pleasure vehicle has become more generally used and the results most gratifying not only to the manufacturers of vehicles and the vendors of power but also to the owners. The type of electric vehicle which is destined to create the largest and most profitable use of electric power, however, has not yet been developed to its possibility. I refer to the commercial vehicle for transporting merchandise in our crowded city streets.

The vehicle manufacturers, the battery manufacturers, the motor manufacturers and the tire manufacturers are all pushing the electric vehicle business. You have the organization for pushing this business in your local fields by personal solicitation and advertising, and perhaps most important, by demonstration. I would urge you to make an effort to convince yourselves of the economy of operation of the electric vehicle by operating them in your own service. The central station companies in New York, Chicago, Philadelphia and Boston are using large numbers of electric vehicles successfully. These companies have to generate their power by steam. For every ampere of current used for charging storage batteries at night a certain amount of fuel is consumed. Most of the central station companies represented here are in a position to use water power at night which otherwise would go to waste. Is it not therefore all the more important that you profit by the experience of the companies in the East working under more unfavorable conditions and interest yourselves in the use of electric vehicles? The example set by the central station companies undoubtedly would quickly be followed by others and the business would soon be established.

After operating electric vehicles for the period of a year or two, you would have compiled data and information which would be readily accessible to any one in your district wishing to consider the use of electric vehicles. This would be most valuable as conditions often differ very materially in different localities, and the prospective user is sometimes skeptical of results obtained at some distant point.

Transportation is just as much an engineering proposition as the equipment of a factory with power. The problem of replacing horses with electric vehicles is similar to the substitution of electric motors for steam or gas engines. I venture to state that most of you have done considerable engineering for industrial companies in your locality to convince them of the economy of shutting down their power plants and to operate their factories by electric motors driven by purchased power. I also venture to state that in connection with these problems you have found many companies ignorant of their real costs?

This same condition is found in the transportation problem. Few companies realize the costs of operating trucks and delivery wagons, their accounts being so arranged that the total costs are not apparent. I think it will pay you to approach the transportation problem as you do the industrial power problem.

I have mentioned some of the advantages which would accrue to the central station by the general

adoption of the electric vehicle. The advantages to the users and to all the people of the large cities are great. Think for a moment of the noise due to the horse drawn trucks and other vehicles eliminated and in its place the hardly perceptible hum of the electric motor and transmission apparatus. Also consider the fact that the capacity of streets to accommodate traffic would be doubled by the elimination of the horse and in some cases trebled. In most cases the horses occupy about one-half the space occupied by the team. I also estimate that the capacity of the streets would be again doubled by the increase in speed, due to the introduction of electric power. This would mean that the capacity of the streets would be increased by four.

The necessity of rough stone-paved streets for the purpose of preventing horses from slipping would be eliminated—all streets could be smoothly paved. Cleanliness would be greatly increased, which would be a great advantage to pedestrians having to cross the streets. Every gust of wind would not lift a cloud of filth to blind the passer-by and to spread disease.

Electric Bank Wagon

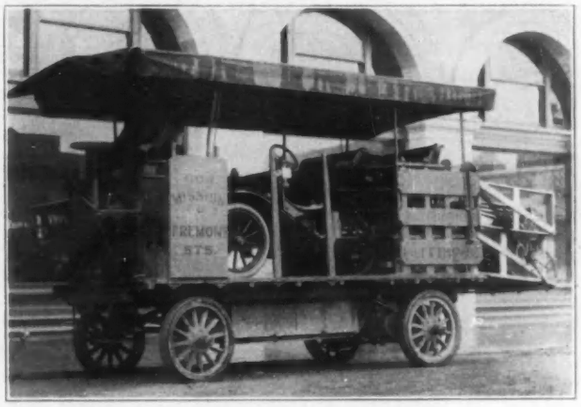
Unhealthy and objectionable stables in the congested districts would be eliminated. The electric garage would occupy much less space than the stable and could be in keeping with either the commercial or residence districts. The army of street cleaners would be reduced to a small number.

The gasoline automobile has had a phenomenal growth and has come to stay. For use in cities and especially in congested districts, however, the electric vehicle is better adapted. It is less noisy, requires fewer repairs, has a lower cost of maintenance. The electric motor requires fewer repairs than most any other type of power apparatus. Any repairs required on the battery may be made without putting the vehicle out of service, as the battery is divided into small sections, any one section of which can be removed and replaced by another. The repairs of the engine on the gasoline driven machine requires the machine to be out of service during such repairs. The absence of odor or unhealthy gasses in connection with the electric vehicle is another important consideration. The electric vehicle is the most easily operated, requiring less skill and knowledge of mechanics. In other words, the electric vehicle is more nearly "fool proof" than the gasoline vehicle.

It is not the intention of this paper to quote statistics to show how many dollars each one of your prospective customers will save. The progress already made in different parts of the country is proof of the practicability of the electric vehicle, both for commercial and pleasure purposes.

It is estimated that fully 10,000 electric vehicles are now in use in this country. Southern California and Seattle are the two localities on the coast showing the greatest development along these lines. Los Angeles and vicinity, including Pasadena, Riverside, Redlands, San Bernardino, Santa Barbara, and in fact the district covered by the Edison Electric Company of Los Angeles, has in use about 575 electric vehicles.

The rate for current in Southern California varies from 2 to 6 cents per k. w. hour, according to the amount of current purchased and according to the character of the user—that is, whether operating a private or a public garage. In private garages the average income per month per vehicle is $5. No data is available showing the income per vehicle in public garages, but the total income from public garages in that locality varies from $50 to $200 per month. For the purpose of arriving at some definite figures: if it is assumed that the income per vehicle is only $3 per month, the total income per year from 575 vehicles would be $19,500.



Electric Truck

There is only one company in Southern California operating electric trucks. This company operates about 12 trucks and has been doing so successfully for the past three years. Should all the trucking of Los Angeles alone be done with electric vehicles, it can readily be appreciated what an enormous increase in power consumption would obtain.

In Seattle there are about 100 electric vehicles, including both those used for pleasure and commercial purposes. Electric trucks have been operated in Seattle long enough to demonstrate their practicability, and this is important not only in demonstrating the success of the electric vehicle in still another city, but in a city where grades are frequent and steep. Steep grades have always been the bugbear of the electric vehicle, but experience has now demonstrated that with proper design and high efficiency the electric vehicle is as well adapted to the hill as any form of vehicle.

New York City has the largest number of commercial vehicles in use of any city in the country, there

being about 1000 in service at this time. Chicago has the largest number of pleasure vehicles in service of any city in the country, there being about 3000 in use there at this time.

I would urge you to get into touch with the manufacturers of electric vehicles and obtain from them figures on actual performances, then to purchase and demonstrate the practicability and the economy of operating them for your own service, and finally plan a campaign that will eliminate the noisy and unhealthy methods of transportation in your cities, and place the electric vehicle where it belongs.

Your income begins the moment an electric vehicle is sold in your territory. You have no development or other expenses except for demonstrating for your own satisfaction and for advertising. The manufacturers of electric vehicles and their accessories are now leading in this campaign, but you are in the strategic position and they want you to lead that they may stand behind you and push.

The former indifference of the central stations to the desirability of the electric automobile as a source of revenue is perhaps founded on prejudice. Their first impressions of a crude, imperfect machine, which like an un-fledged bird is as yet untried, should not afterwards hinder its advancement, especially when it is a machine that has so greatly improved with time as has this. What with increased efficiency in running qualities and greater capacity of batteries, it is a far cry from the electric automobile of five years ago to that of today.

The electric car is distinctly a city machine, in direct contrast to the touring ability of the gasoline. The speed of the electric is greater than that ordinarily allowed by city regulations and its daily mileage capacity is in excess of the usual requirements for either business or pleasure. However, it is neither our intent nor our province to here advertise the electric carriage, but rather to demonstrate what a money-maker it may become for electric power companies.

An automobile uses more current for its storage batteries in one month than a cigar-lighter does in ten years. Furthermore, its current is consumed after midnight, off the peak, when costly apparatus would otherwise be idle while the interest on the investment piles up, water power runs to waste and depreciation continues. Here it is that the electric automobile does service as a grading machine in filling the "valleys" in the load curve. But little extra investment is required to supply the current needed. The demand is steady and it is permanent. The storage battery is probably the best automatic corrector of the load factor yet devised. It works while you sleep.

As the most desirable customer, the electric vehicle owner should also be the most favored, and as such entitled to a low rate for current. With a moderate current cost it is no more expensive to keep an electric car than a horse, and central station companies can do more good for themselves by encouraging the use of electric vehicles than in almost any other way. This encouragement may take several forms, including the use of commercial vehicles for trucking, and runabouts for collecting. But particularly may it be accomplished by lowering the power cost to a most beneficical consumer.

ELECTRIC VEHICLE CAMPAIGN OF THE BROOKLYN EDISON CO.[1]

Greater efficiency and economy in the operation of electric vehicles of all description are two of the results of a most elaborate campaign of education and personal instruction on the maintenance of the electric automobile recently inaugurated by the Brooklyn Edison Electric Illuminating Company and already proven to be of the utmost value to users of these vehicles. In fact, it may be said that the electric has come into its own. New vigor has been injected into the very heart of that branch of the industry with which the public comes in contact, new significance has been given to the electric as a factor in commerce and pleasure, and the greatest promise in the effort now being made is the complete dissipation of whatever groundless prejudice still remains by pointing out to users the mistakes they have made and showing how to avoid them.

The real magnitude and importance of this campaign will best be realized by those intimately connected with the business of electrical vehicles, which have suffered more abuse and ridiculous criticism than almost any worthy product that has been offered to the public or the business world. Manufacturers of gasoline automobiles have, it is true, been obliged to do a great deal of missionary work, for only a few years ago there were traveling representatives who did nothing but aid owners in keeping cars on the road, but this effort became unnecessary by the gradual perfection of the automobile, whereas the electric reasonably may be said to have been perfected long ago to an extent of parity with the present gasoline car, yet lack of knowledge of the primary details and failure to apply ordinary intelligence kept the electric in the background until someone came out and said: "The electric is cheap, it's efficient, it's reliable," and then proved it!

That is exactly what is being done. And right here it should be said that the electric automobile or its vital agent, the storage battery, does not need a chemist or a battery expert to keep it in service if a few important suggestions are followed. The first attempts have shown wonderful results along this line, and other cities are following in the same footsteps.

J. F. Becker, head of the contract department of the Brooklyn Edison, declared that during the last few weeks the company had done more business in electric vehicles than in the past year.

The whole subject was considered at a recent convention of the National Electric Light Association.

It was the most important communication which the "Lightning Tamers" had to make to a waiting world. Electric vehicles had so far conquered their difficulties that they were prepared to put the horse out of business and do his job better than he ever knew how.

James T. Hutchins of Rochester, awakened the convention when he presented a paper on "Relation of Electric Vehicles to Central Station Business." Speaking for the Rochester company he said:

"Our sales of electric current for charging storage batteries for vehicles have increased from 285,470

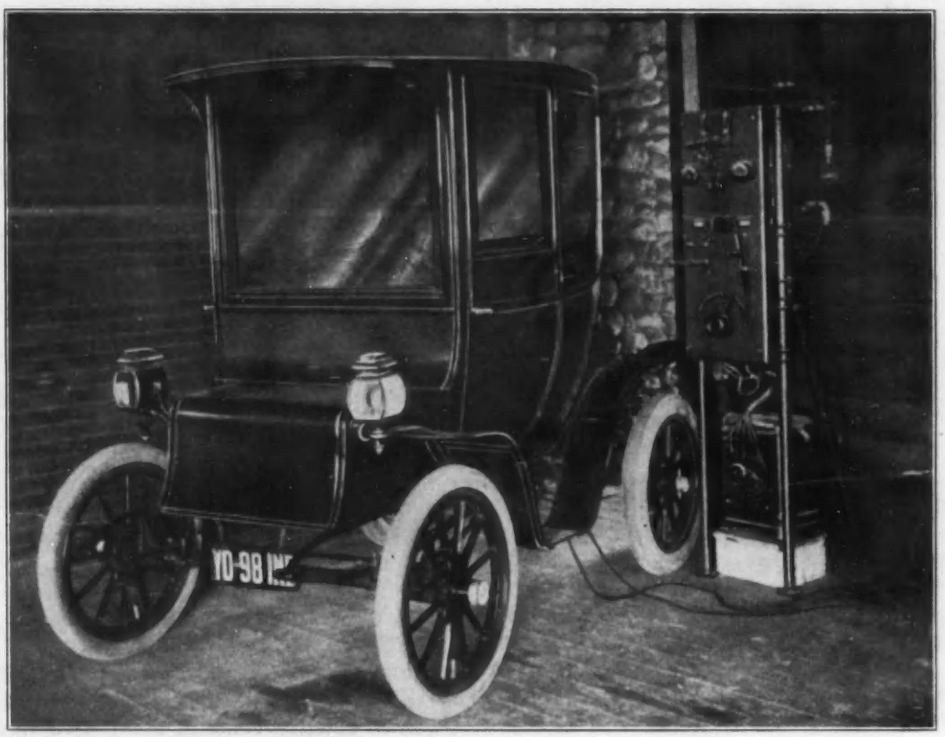
[1]The Brooklyn Daily Eagle.

kilowatt hours in 1906 to 495,490 kilowatt hours in 1908, or by 73 per cent, and our income for the corresponding year from $12,458.91 to $19,796.56, or by 59 per cent.

Mr. Hutchins explained how the Rochester company over a year ago, organized a department to take entire charge of electrical vehicle business, investigate troubles and make improvements. The department found that the principal carting and trucking firm in the city had two electric trucks which had not been in operation for eight months.

"These trucks, properly operated," he said, "should give us an income of from $50 to $60 a month." The owners stated that the only reason the trucks were not operated was the excessive cost of maintenance and their unsatisfactory performance.

"In order to place these trucks in commission the department made this proposition to the owners: That we would fit up the two trucks in A1 condition, and that if, at the end of sixty days' trial, the owners were not satisfied with their operation, there would be no charge for the repairs. If, however, the trucks were made satisfactory, we would charge the owners for only the actual material used, making them a present of the labor and current used in putting the equipment in first class condition."



Charging an Electric Vehicle with Mercury Arc Rectifier.

The truck owner was so pleased with the result of the renovation that he paid the company $1,000 for material used and is now considering purchasing more of these heavy trucks. He found out what had been the matter.

On comparing notes he found that, whereas under his supervision it was necessary to give the battery only 40 ampere hours charge on a particular day, under the former operation and for the same conditions of running, a charge of 180 ampere hours had been used, 140 of which had been wasted and had served only to decrease the life of the battery by softening the plates.

"To cite another instance," continued Mr. Hutchins, "a woman owning a runabout had taken this machine to a number of different garages for repairs, and in each case it had been brought back in worse condition than before. She was absolutely disgusted with the entire proposition, and we learned that she was negotiating for a gasoline runabout. Our superintendent saw this woman personally, and she stated that if the runabout could be made to run fifteen miles satisfactorily on one charge she would be very glad to pay any reasonable amount for the repairs, but that if he found that he could not do this she would be glad to make him a present of the vehicle to get it out of her sight.

"A careful inspection of the outfit showed that the controller had shifted in such a manner that whenever it was used the battery was practically short circuited, also the battery was found to be badly sulphated. The vehicle was brought to our shop, the controller repaired and the battery reformed. Our superintendent then took the owner for a drive of twenty-five miles, and she was so pleased with the operation of the vehicle that she requested the privilege of sending all her friends who owned electrics to our repair shop."

Most of the cities east of the Mississippi were represented at the convention, and Rochester's tale of triumphant electrics was listened to with great interest.

The delegates from Brooklyn, headed by W. W. Freeman, vice president and general manager of the Brooklyn Edison Electric Illuminating Company, paid special attention to the paper on electric vehicles, and when the Brooklyn Company section of the National Electric Light Association held its own convention at the Oriental Hotel, Manhattan Beach,

on June 23, the subject came up for exposition and discussion

C. A. Graves presented a synopsis of Mr. Hutchins' paper, and Mr. Freeman, commenting on it, said:

"I think, if there is a subject that electric people give too little attention to, it is this, and if I judge correctly from remarks made among ourselves, as well as others, we electric people have been taking the electric vehicle largely as a joke. We go around in gas cars and dismiss the subject from serious thought. There is no question that excited more real interest and lively discussion at Atlantic City, especially among the commercial men; and statements were made there that we ought to regard as authentic that are surprising.

"I realize that the electric vehicle has its limitations, as had the gasoline car, but we electric people do not realize what a field there is right now for the electric vehicle as a builder of revenue for the central station. When I go to Cleveland, Chicago, Washington or Rochester, I see many electric vehicles, and I find that these central stations have been doing a great deal of this business.

"Undoubtedly the electric vehicle has been slow in developing, and the machine which we have in mind and such types as we own ourselves and have on the scrap heap are not typical of the electrical vehicle of today. I believe that the central stations are awakening to this business and I believe that one of the many things we have learned from this Atlantic City convention is the future possibility of the electric vehicle for the building up of our revenue, and I hope the members of this section will hear more from the subject at this time, so that there will not be any danger of our falling asleep on the subject.

J. F. Becker, head of the Brooklyn Edison contract department, announced that his department was wide awake on this very subject. He declared that J. N. Walton had been retained as battery expert of the contract department "for the purpose of securing electric vehicle business, and to educate and instruct the users of the electrical vehicle in the proper maintenance of their batteries, and if, in the course of your duties you come across the owner of a vehicle that requires such service, we would consider it a favor if you would let us know.

"The electric vehicle is not to be compared with the gas car," said Mr. Becker. "It is rather in comparison with the horse, doing just twice the amount of work in half the time. The electric car is for intermediate service, while the gas car is used in competition with the railways."

W. Yeager took exception to Mr. Becker's comparison of gas and electrics. He gave this:

Comparison showing an average case of improvements in up-to-date electric delivery wagons over those made a few years ago:

Capacity of vehicle 1,000 pounds load.

OLD CAR—Battery, 44 cell, 13 plates.
Weight: Car body, 2,000 lbs.; 2 motors, 500 lbs.; car complete, 4,850 lbs.
Mileage: 25 miles.
Cost of current: 25 miles, $0.84; per mile, $.036.

NEW CAR—Battery 44 cell, 9 plates.
Weight: Car body, 1,050 lbs.; 1 motor 200 lbs.; car complete, 3,240 lbs.
Mileage: 40 miles.
Cost of current: 40 miles $0.44; per mile, $.011.

The following data shows average operating and maintenance costs of a certain balanced gear type electric truck of 3,000 pounds capacity. Mileage on one charge 35 to 50 miles and in some cases 70 miles have been made.

On a basis of 25 miles run per day, or 7,500 miles per year, the cost per year figures:

Battery repairs and renewals	$150.00
Tire repairs and renewals	142.50
All other repairs and renewals	75.00
Total per year	$376.50

or 4.9 cents per mile.

Electric Vehicle vs. Horse Haulage.

An illustration of the advantage and economy gained by electric vehicle over horse haulage is shown in the following record of a specific case:

One two-ton truck replaced two two-horse trucks working twelve months and one additional two-horse truck during the winter months.

Cost of horse haulage for two years was	$9,325
Cost of electric truck, for current, tires, driver and all maintenance was for two and one-half years	3,937
Interest on cost two and one-half years	690
25 per cent of investment written off	1,285
	$5,912

Saving in same period over horse haulage was $3,413.

A well-known brewing company of St. Louis has effected a saving of 50 per cent, by the use of electric trucks and wagons over horse haulage. They have been using electric vehicles over six years and now have over fifty in service in that city.

Sample records taken from express deliveries show for a 1,000 pound wagon daily mileages from 30 to over 50, making from 30 to 175 stops and deliveries, and in 37 days an aggregate of 1,751 miles; two-ton wagons showed records of 32 to 47 miles with from 125 to 180 deliveries. This undoubtedly exceeds twice the amount of work a good team of horses could do.

J. N. Walton has been at work educating Brooklyn users of electric vehicles about five weeks. He finds that the main trouble has been in regard to batteries. Users of vehicles have not taken sufficient care of them.

"The acids and water used in batteries should be pure," said Mr. Walton. "Manufacturers of the vehicles give that advice to their patrons and usually that advice is followed, but even where that has been done subsequent care is necessary. For instance, one man was found who bought 100 gallons of distilled water and then stored it in a corroded iron tank. Of course, that carried iron into the battery, making battery trouble for which the battery received the blame, though in nowise culpable.

"The practice of some electric vehicle users has been to wash the batteries and set the plates on the concrete during the process. They forget that concrete contains iron and that the plates, when restored to the battery, would carry iron with them and make trouble.

"A battery should not be discharged below 1.8 volts per cell, as further use without renewal causes the formation of an impervious sulphate which is very

injurious, shortening the battery's capacity and life. Do not use up all the energy that the battery will yield. Instead, cease using as soon as possible when there is a sign of failure, and renew the charge at the earliest opportunity.

"There are nearly 300 electric vehicles of all kinds now in use in Brooklyn, and the outlook promises a great and rapid increase; one express company has 40 of these vehicles, Frederick Loeser & Co. uses them extensively, another express concern is to run electric vehicles and a contractor is about to use six heavy electric trucks.

"The electric vehicle is not complicated or hard to manage. All that it needs is a little reasonble care. If the following rules are observed, troubles will vanish:

Rules for Care of Battery.

1. Do not overcharge battery.
2. Use only distilled water and chemically pure acid.
3. Never adjust specific gravity of solution by adding acid until cause of the change in specific gravity is found and remedied.
4. Maintain the solution at standard level and at standard strength by testing and adjusting once in two weeks.
5. Keep the cells clean, all wood work well painted and metal work protected by acid-proof varnish or vaseline.

C. A. Graves of Brooklyn Edison's power department, who is supervising and assisting the electric vehicle campaign, said:

"These vehicles have made great advances during the past two years. They beat horses. Delivery people figure that a fair horse is good for only fifteen miles a day. The electric vehicle does thirty miles a day. Besides, hot weather has a bad effect on horses, but vehicles are all the better for it.

"There have been many improvements in these vehicles. Some new makes use one motor in place of two and get better results. The best size and style of tire for each particular sort of vehicle has also been discovered, and that is a distinct and important advance."

PACIFIC COAST ELECTRIC VEHICLE ASSOCIATION.

QUESTIONS AND ANSWERS.

Question 1. How often should a vehicle battery be charged.

Answer 1. It is very difficult to state definitely how often a vehicle battery should be charged, as there are a number of conditions to be taken into consideration.

If a battery has been discharged to less than 50% of its capacity, it is not advisable to charge immediately, unless the trip or run considered is such as to demand more than the available capacity remaining in the battery. It is more advisable, if conditions allow it to discharge a second time, if there is sufficient capacity present before recharging. By following this procedure, a longer life, and therefore greater mileage, will be obtained from the positive plates, as the life of a plate is dependent on the number of charges.

Naturally, if a battery has been partially discharged, e. g. less than 50%, and a trip that will consume nearly full capacity is to be made, it would certainly be advisable to charge the battery fully before starting. In general, where a battery is two-thirds discharged, it is advisable to charge except where very short trips are to be made.

Never allow a battery to stand more than two weeks without a freshening charge, no matter how little it has been discharged. A guide to the capacity available can be obtained by keeping an accurate record of the specific gravity of the electrolyte.

Question 2. How often should electrolyte be added to a cell?

Answer 2. If the manufacturer's instructions call for a definite specific gravity at the end of charge, e. g. 1280, electrolyte should not be added until the specific gravity of the cells fails to come up any higher than 1250 at the end of charge. If a few cells show on test low specific gravity compared with the remainder of the battery, these cells should be charged separately in order to be certain that the low specific gravity is not due to the cells being partially discharged or worse. If the gravity increases during such a charge, it is an indication that such cell or cells so treated have run down lower than the adjoining cells.

In adding electrolyte to a cell, it is recommended that the specific gravity of the liquid should be about 1280, if the manufacturer's standard calls for this value when the battery is fully charged. This will gradually restore the specific gravity to normal, if it is added from time to time when replacing evaporation.

Question 3. Is there any advantage in using distilled water to replace evaporation?

Answer 3. Yes, there is an advantage. Much of the city water in California is high in chlorine. This is injurious to the plates. It may be that in many cases this percentage of injurious matter is not excessive, nevertheless, the cell would be much better without it. Portland city water has been found safe to use while in some cases, Seattle water has been found to be good, while in other cases, it has been bad. If it is found to be possible to use distilled water, it is far preferable to that from the city mains, wells or other sources.

Question 4. How should a battery that is idle for some length of time be treated?

Answer 4. If a battery is not to be used for a length of time, it should first be fully charged before standing. If it continues to remain idle, it is advisable to give it a freshening charge about every two weeks, continuing this charge until all the cells begin to gas freely. If the battery is to be out of service for several months and it is not convenient to give the freshening charge bi-weekly, it should be taken out of commission.

Question 5. What is the best method to pursue in taking

Answer 5. Charge the battery in the usual manner, con-

Answer 7. Charge the battery in the usual manner, continuing until the specific gravity of the electrolyte of every cell shows no rise for a period of one hour. Disconnect the cells as noted in Answer 5; remove the covers, remove the elements from the jars, remove the separators from the plates, both wooden and rubber, and wash with a gentle stream of water both positive and negative plates, and then allow them to dry. The positive plates when dry can be put away. If the negative plates, in drying, show any signs of heating, they should be sprinkled with clean water to keep the temperature down and then allowed to dry thoroughly. When they are dry, immerse the negative plates in electrolyte of about 1275 specific gravity and allow them to soak 3 or 4 hours. This can be done very easily by replacing them in the jars from which they were removed. After again rinsing and dry, they can be put away. The rubber separators should also be washed in water but the wood separators had better be thrown away as they will not stand much handling after they have been in service.

When the battery is again to be put into commission, it should be treated in precisely the same manner as if it were a new battery and the manufacturer's instructions for assembling and installing should be closely followed.

METHOD OF HANDLING COMPLAINTS.[1]

J. H. WHITAKER.

No branch of electric service is of more importance to the welfare of an Electric Company than the complaint department; the value of this branch of the service cannot be measured in dollars as but a small percentage of the debits and credits appear on the books. The item of salaries to employes "shooting trouble" plus a small amount for material is about all that is tangible and this is charged up as an expense, but I am sorry to say that in a great many cases no corresponding credit is taken into consideration. The fact however has been amply demonstrated that for the amount invested the complaint department can be made to give greater returns than any other branch of the business.

It is presumed, because of its necessity, that every electric company has some method of taking care of the various complaints, real or fancied, that their customers make regarding service. That these methods vary from a slip-shod system to a practical and well defined plan is a fact.

It is also a fact that no method of handling complaints is better than it should be. No manager can afford to allow any complaint, however trivial, to be overlooked. Every complaint, not only of actual consumers, but from any one, should receive prompt and courteous attention and prompt action taken to remove the cause. Too much emphasis cannot be laid on the necessity of attending just as promptly and as thoroughly to the trivial complaint of the small consumer as that of the large consumer who has a big kick coming. It is not the installation that complains, it is the consumer and he may have only one lamp and yet be able to make as much trouble for you as the consumer using hundreds of horsepower. Why not have him a friend instead of an enemy? The good will of the people in your territory is a valuable asset not to be despised and to gain it and to keep it requires a prompt and courteous treatment. In order to be able to give the attention to complaints that they deserve some uniform method of handling the same should be adopted and strictly followed, for no system will be of any value that is not enforced in every particular. In devising any method or system broad enough to take care intelligently of all cases of complaint the following factors must be taken into consideration.

Promptness in giving attention to each particular case.

Retention of the good will of parties making complaint as far as possible.

A record of each case showing all details and final disposition.

A strict adherence to the first factor will be a valuable aid in the development of the second. It is not enough to repair trouble and leave a customer in an irate frame of mind. There are many cases where prompt attention alone is all that is necessary, but there is no case where prompt attention should not be given by some one. Let this be understood by all of your patrons and it will make your pathway much smoother. You will find it just as easy to be prompt as dilatory. Where the trouble is due to mechanical defects your "trouble man" in most cases can do all that is necessary; but where revenue is effected some one in authority should give it prompt personal attention.

Not by any means am I attempting to convey the idea that all claims are valid, in fact but very few are, but this only emphasizes the fact that they should be taken care of promptly and with judgment and treated in a business-like manner. Do not allow the expression "I complained but got no satisfaction" to gain a foot-hold in your territory; be as prompt to acknowledge a valid claim as you are to resist an invalid one. Correct your errors promptly; this is easily done, but tact and diplomacy are required to meet an unjust demand in order to maintain your rights and satisfy your customer. Get acquainted with the people you serve not altogether through your solicitors, who too frequently have but one object in view, that of getting contracts but letting those higher up in authority "get busy"; let the manager try leaving his office door open once in a while. If you now have the field to yourself and wish to retain it your greatest effort to prevent ruinous competition should be put forth in giving a satisfactory service at reasonable rates; and this can only be done by a thorough acquaintance with the people you serve. The day is past when the consumer will accept any kind of service at any rate that you think they will stand.

A great aid in minimizing complaints is to instruct your customers as far as possible how to read meters and to compute their bills. A thorough understanding by the consumer of what he is using will do away with a large percentage of kicks of this class. When the minimum charge and rate per k. w. hour is fixed by contract the amount of the bill is under control of the consumer, who can by a glance at the meter compute his daily and weekly consumption and stop the wasteful usage of current. All meters should be inspected and tested ot least once a year and in the case of large installations every six months. The consumer should be advised when such inspection and testing is done and be informed of the result. A record of each should be kept showing date of purchase, size, makers' name and number, date of testing and result of test where installed and when removed, for reference. A card index is especially valuable where meter cards can be kept in serial order for handy reference.

Complaints regarding voltage and poor regulation should be investigated at once; recording voltmeter should be used to determine irregularities of voltage and prompt measures taken to make the service satisfactory.

In taking care of what might be called mechanical troubles, such as repairing arc or Nernst lamps, the blowing of fuses and other minor complaints, I find that a printed form is of great value. This should show the time the call was received and when attended to, the nature of the trouble, who attended to the complaint, what was done to remedy the defect, and what, in my judgment is most important of all, the signature of the customer showing that his complaint had been taken care of to his satisfaction. Whenever a complaint is made let it be attended to at once; do not pigeon hole it but start someone at work at it immediately. Your aim and object should be to reduce to the lowest possible amount their number.

[1]Paper read at Convention N. W. Electric Light and Power Association, Seattle, September 7, 8, 9, 1909.

THE CHEHALIS TELEPHONE SWITCHBOARD.

The newly installed telephone plant at Chehalis, Washington, is typical of a number of similar plants recently installed in several of the fast-growing towns in the Northwest. This installation of a telephone switchboard plant has been made with a view to taking care of future requirements for a considerable length of time. The board furnished is a Western Electric Company Standard No. 10 multiple board. The present equipment consists of 30 toll and farmer magneto lines and 300 lamp signal common battery lines, with the necessary multiple jacks arranged so that any operator can make immediate connection with any line connected to the board, without trunking of any kind. The ultimate capacity of the board is 1,600 lines. It is estimated that this will take care of the total business of the city for a large number of years.

This board is particularly noticeable because it is

Chehalis Switchboard.

self-contained, having all the relays and working apparatus mounted in its own cabinet. The only equipment of any kind mounted away from the board is the main distributing frame shown in the cut. This frame has the standard protection apparatus and is mounted in a very convenient manner for making connections from outside lines. The intermediate frame provided in the cabinet shown at the left end of the board makes it possible to divide the load among the operators, as it is not necessary to have any line come in on any particular section.

The board is built of hardwood and angle iron throughout and is conveniently arranged for inspection by removing the doors in the back. The service given is so far in advance of that given by the old equipment that Mr. Coffman, the owner of the exchange, is receiving congratulations from every side on the efficient service given. The telephones in use with the board are also Western Electric and they have given satisfaction in every way. A small wire chief's desk is shown mounted at the right end of the board, from which voltmeter tests may be made on any line.

ALUMINUM ELECTRIC WIRES.

The most striking advantage of aluminum over copper is its specific gravity. While that of copper is 8.9, that of aluminum is 2.7 only. On the other hand, it has not yet been found possible to make aluminum wires much lighter than copper wires, as the difference in specific gravities would suggest, because the superior conductivity of copper must be borne in mind. At 15° C., a hard copper wire one metre in length and of one square millimetre section, has a resistance of 0.0175 ohm, while the resistance of an exactly similar wire of aluminum is 0.03 ohm under the same conditions. Hence, to give the aluminum wire the same electric conductivity as the copper wire, its transverse section must be greater than that of the latter in the proportion of 0.03 to 0.0175, i. e., of 12 to 7.

Even this necessity of having the aluminum wire thicker than the copper wire by no means cancels the advantage possessed by the aluminum in respect of its lower specific gravity, for the thicker aluminum wire is still lighter than the thinner copper wire. Hence less metal is required for wires, when aluminum is employed than when copper is used, and the price of aluminum being less than that of copper, weight for weight, the advantage due to the lower specific gravity of the aluminum is very real although not quite so great as it would be if the two metals were equal in conducting power.

Seeing that for conductors of equal length and conducting power the aluminum wire is stouter than the copper wire, there is no fear of the former metal being wanting in strength, for, roughly, copper has about twice the tensile strength of aluminum, and, as just shown, the aluminum wire must have about double the section of the copper wire to have the same conductivity. Besides the aluminum wire being lighter than its equivalent (as a conductor) of copper wire, it has less stress to incur than the latter in respect of its own weight.

It is now obvious that there need be no hesitation in using aluminum wires instead of copper, or in replacing copper wires past service by aluminum, instead of by new copper ones. All that has to be done is to have the aluminum wires of the proper transverse section. The only practical difficulty consists in joining up different lengths of aluminum wire. The problem of soldering aluminum has yet to be fully solved, but for making these junctions other means than soldering are at our disposal. Metal unions render excellent service, the two ends to be joined being fixed inside the union tube, itself, of course, a conductor, in close contact with each other and with the tube. But the diameter of these unions must not be too great.

Electric cables are very advantageously made with aluminum wire. The fact that they have to have a larger diameter than those made with copper wire in respect of the smaller conductivity of aluminum already insisted upon sufficiently, is compensated for, over and over again, by the greater flexibility and extensibility of aluminum, whereby there is far less chance of breakage in a cable with it than with copper. Copper wire will not stretch more than about 3% in length before breaking, while the average corresponding percentage for aluminum is half as great again.—Electrical Engineer.

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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NOTES

Look after the insulation and accidents will take care of themselves.

The word electricity is derived from the Greek word 'elektron,' meaning amber. It was first used by Dr. Gilbert at the end of the sixteenth century because amber was the first material to exhibit the properties of static electricity.

One of the most practical means of increasing the range of the electric vehicle would be a portable and indestructible rectifier for alternating currents. Such a device could be carried on the machine for field use, and could supplement a more efficient type, such as the mercury arc rectifier. This ideal is said to have been attained by a professor in one of the California colleges, who is not yet ready to give full publicity to his invention.

The peculiar odor in conjunction with a mercury vapor lamp is reported in the "Electrical Engineer" of London to be an excitement of the olfactory nerves, due to the electric charges of the ionized air surrounding the lamp. This suggests that other electrical odors are due to the same cause and not to the formation of ozone. Some enterprising inventor may yet succeed in supplying the agreeable perfume of flowers with the pleasant breezes from an electric fan.

Power from producer gas has been a long time coming to the Pacific Coast, but if we can accept the statements of the manufacturers as correct it has at last arrived. The low grade coals of the Northwest and the crude oil of California are the fuels, and the ingenuity of the manufacturers of gas engines, the means. In Eastern Oregon and Washington, lignite coal costs from three to six dollars per ton, and is available in large quantities for the gas producer. In California it is readily possible to produce one brake-horse power per pound of oil, one western manufacturer even guaranteeing one kilowatt hour at the switchboard per one and one-quarter pounds of crude oil consumed in the producer.

"Jumping from the frying pan into the fire" is child's play as compared with the difficulties that will be met by the public utilities committee of the San Francisco Board of Supervisors should they attempt to carry to completion their proposed plan for a municipal street railway. The scheme is to utilize the Geary Street road as the nucleus and then to take up the various private franchises for other roads as they expire. It will also include the project of constructing a cross-town line on Stockton Street and of excavating a subway on Market Street. A little publicity given to the "horrible example" set by T. L. Johnson and the Cleveland municipal ownership fiasco should be sufficient to quench the enthusiasm of his emulators.

The Kern River hydro-electric plant of the Edison Electric Company of Los Angeles is now supplying 35,000 horsepower to the company's lines. This means that the steam-power plants at Los Angeles, Santa Monica, Redlands and Santa Barbara may be reserved for emergency. Great credit is due to Mr. B. F. Pierson, superintendent of construction, for the expeditious manner in which this plant has been completed nearly two months ahead of contract time. This plant is Kern River No. 1, there being four others contemplated, which, with a plant on Kings River and one near San Bernardino, will give an aggregate capacity of 200,000 horsepower.

N. W. Electric Light and Power Association

With the close of the past week's convention of the Northwest Electric Light and Power Association at Seattle, Washington, this organization has successfully rounded out the first year of its existence. Originally formed to more closely cement the common interest of the central stations, it has gradually grown in power as a disseminator of information among member companies, and as a promotor of amicable relations between public service corporations and the public.

Its greatest work has been in formulating a uniformity in policy among the central stations, with particular reference to uniform accounting and methods of computing rates. Unlike some organizations, it's work has been continuous throughout the year and is not confined to the rare occasions when all can get together in convention. The position of Secretary has been an active one, requiring much correspondence in informing the members of legislation and acts that may effect their welfare. Incidentally, the meetings afford a convenient means of presenting papers dealing with the latest improvements in electrical art. Several of these have already appeared in this journal, and the rest, together with full report of the proceedings, will appear in our next issue.

The Electric Vehicle

The first fundamental in the business of selling electric current, as in selling anything else, is to profitably please customers. The essentials of such profitable pleasing in the electric business are low rates and reliable service, which are themselves synonymous with a high load factor. This problem of improving the load factor is probably the most important one now confronting the central station. Any means that will increase the average demand so as to bring it near the maximum is welcome. A low load factor means a high current cost, whereas a high factor means that the current can be profitably sold much cheaper. The reason for this is that there must be enough generating apparatus available at all times to supply the maximum demand. When this demand is lessened, the apparatus is idle; such idle machinery means that the investment it represents is also idle, although the depreciation and expense of operation is continuing. A certain part of this idle expense must be applied to the selling price of the current in order to make the venture profitable. Therefore, the longer the machinery can be kept in operation, the lower the price at which the current can be sold.

The maximum load of most companies is the lighting load at night, at which time, the graphic curve makes a sudden rise, known as a "peak." The problem of minimizing this peak or of smoothing the curve is much like that of the regrade work now being conducted by the city of Seattle. The lighting company is working under the disadvantage that they cannot take the top of the peak to fill in the low places, but, like the builders of Moscow, must bring in new material as a filler. Most electric companies are consequently, encouraging the sale of electric appliances which will use the excess power during the day, but not at night. Electric drive in manufacturing establishments as well as the many domestic labor-savers now on the market are thus desirable additions to the circuits. But there yet remains a time in the night when most of us sleep; the lights are turned out; the street cars stop, and the factories do not run. If some means that would take current at this time were provided it would reduce the average cost.

Such a means is found in the electric vehicle, which is just coming into extended use, as a result of the vigorous campaign being conducted by the manufacturers of electric automobiles. Nearly ten thousand electric vehicles are already in use. Each of these machines requires from $4.00 to $5.00 worth of electric current each month, which is more than is used by the average lighting consumer. They can conveniently take the current between midnight and dawn, when the generators are otherwise lightly loaded. They already form an important part of the load on many Eastern circuits, but have been somewhat neglected in the West.

In the East most of the plants are run with steam, and when a part of the machinery is idle the fuel consumption is reduced, but in the West, where water power is such an important factor, idle machinery means that the water is running to waste, especially where there is little facility for storage. It is consequently particularly essential to economy of operation that western companies encourage the electric vehicle. A little encouragement in the way of a favorable rate, and also an object lesson in the way of company use would be a favorable adjunct to the selling campaign being pushed by the garage. It would be poor policy for an electric power company to light its premises with gasoline; it is fully as inconsistent for the central stations to employ a gasoline automobile around town when the electric vehicle is available. Its silence of operation and ease of handling, combined with its enhanced safety, makes it the ideal machine where it is not necessary to go more than seventy miles from a source of electric supply, and what business has an electric man elsewhere?

JOURNAL PORTRAITS

Arthur Gunn is president of the Wenatchee Electric Company and the prime mover in the organization of the Northwest Electric Light & Power Association, of which he has been president during the past year. Though a native of Kentucky, he spent his boyhood in Illinois and Missouri, coming to Washington upon the completion of his college course in 1887. Being a printer by trade he was interested in the newspaper business for two years and then became a bank clerk until he finally went to Wenatchee, Washington, in 1892, when he founded the Columbia Valley Bank.

In 1896-8, having disposed of his banking interests, he built the first of the great irrigation ditches in the Wenatchee valley. This was financed by the Great Northern Railroad and the engineering and structural difficulties have been more than compensated by the benefits to the community.

Arthur Gunn

In 1902 he became interested in the Wenatchee Electric Company and in 1904 purchased the control and took over the management of the company.

Mr. Gunn was a member of the Washington State Senate from 1905 to 1908 and has been intimately connected with public affairs for many years, serving on the executive board of the National Irrigation Congress, the Wenatchee Commercial Club and the N. W. Electric Light & Power Association.

At Yokkaichi, Japan, the electric light company has installed a 750-kilowatt Westinghouse turbo-alternator in its Miye Ken plant, near Nagaya. The turbine is to operate at 200 pounds steam pressure, exhausting into a vacuum of 27 inches. Three-phase, 60-cycle current at 2200 volts, for lighting and power purposes, will be supplied by the new generator, supplanting the old reciprocating-engine-driven equipment which is to be taken out. Three 55-horsepower Westinghouse gas engines have been installed by the Furawaka Coke Works, of Tokio, to operate their coal-washing plant. These engines will use as fuel the sulphur gas derived from the coke ovens, having an average calorific value of 460 b. t. u. per cubic foot. This new equipment is additional to a pair of 11 by 12 inch two-cylinder Westinghouse gas engines driving a Westinghouse 125-volt direct-current generator.

PERSONALS.

Walter Wilcox has been appointed general manager of the Home Telephone Company at Portland.

W. W. Wishon, general manager of the Consolidated Manhattan Mining Company, is in San Francisco.

J. B. Castle, mechanical expert on the Pacific Coast for the Lukenheimer Company, has returned from the factory in the East.

A. W. Lewin was advanced on September 1st to the position of manager of the New Orleans office of the Sprague Electric Company.

W. P. Mills, a mine owner of Sitka, was a recent visitor in Seattle with regard to putting in a steam generator plant to light Sitka, Alaska.

H. W. Crozier has been appointed purchasing agent for the San Francisco office of Sanderson & Porter, in addition to his other duties.

F. M. Caldwell, president of the Caldwell Bros. Co. of Seattle was thrown from a horse August 21, and though seriously injured, is doing well.

John Sturgess, the designer of the Sturgess water wheel governor, and now western sales manager for the Platt Iron Works, is in San Francisco.

Arthur F. Scaife, a member of California No. 3, N. A. S. E., has accepted a position as inspector and expert with the Western Elevator Company of San Francisco.

R. B. Daggett, Pacific Coast manager for the Electric Storage Battery Company, is attending the convention of the Northwest Electric Light & Power Association at Seattle.

W. P. Harper, manager of the purchasing and stores department of the Allis-Chalmers Company, who is touring the Pacific Coast States, will spend a few days in San Francisco.

T. E. Collins, of the Westinghouse Electric & Manufacturing Company, has returned to San Francisco from Sacramento, where he had charge of the company's exhibit at the State Fair.

J. P. Jollyman, formerly assistant superintendent of construction of the Pacific Gas & Electric Company, has been made superintendent of powerhouses for the Great Western Power Company.

A. G. Jones, sales engineer with the San Francisco office of the General Electric Company, left this week for Seattle where he will read a paper before the Northwest Electric Light & Power Association.

F. H. Gale, head of the publicity department of the General Electric Company, will come to Seattle to attend the convention of the Northwest Electric Light and Power Association, immediately after attending the Edison Electric Convention at New York.

N. P. Wilson has been transferred from the Pittsburg erection department of the Westinghouse Electric and Manufacturing Company to Seattle, Wash., where he becomes district engineer, succeeding L. S. Haskins, who is now with the sales department at Spokane.

J. E. Woodbridge has resigned from the railway engineering department of the General Electric Company to take charge of the work of supplying power to the United Railroads of San Francisco from the Stanislaus transmission lines, he now being connected with the firm of Ford, Bacon & Davis.

TRADE NOTES.

The University of California has received a 100 horsepower synchronous motor from the Allis-Chalmers Company.

The Holabird-Reynolds Company of Los Angeles has moved into more commodious quarters at 218-220 East Third street.

The city of Eugene received this week two 600 kilowatt water wheel driven generators from the Fort Wayne Electric Works.

The General Electric Company has closed a contract with the Hammond Lumber Company for 750 kilowatt, low pressure turbine.

B. Jacobs of Portland has just purchased a 300 kilowatt Curtis turbine from the General Electric Company. The generator is 660 volts, 1800 revolutions.

Manny-Myers Company, northwestern agents of electrical and telephone supplies, have moved from 406 Central Building to 520-24 First avenue South, Seattle. This gives more space and better shipping facilities.

The Westinghouse Electric Company has closed a contract with the Pacific Lumber Company in Scotia, Humboldt county, for a 300 kilowatt steam turbine. The turbine will run with exhaust steam from the mill engines, which are 500 and 750 horsepower.

Kilbourne & Clarke of Seattle have been manufacturing extensively for some time past a special type motor generator 1 and 3 kilowatt size for wireless equipment on steamers. They have recently applied for patents and begun the manufacture of a rotary transformer for the same purpose. The transformer is a smaller machine and does the work better than the generators.

The Western Electric Company announce that they are now in a position to furnish Sunbeam tungsten lamps in voltages between 200 and 250. The lamps are made in four sizes at present, namely, 45, 70, 112 and 180 watts. They are of the well-known Sunbeam quality, and have given up to date equally as good satisfaction as tungsten lamps of 110 volts range.

The United Iron Works, of Spokane, has received the contract for putting the $50,000 power plant in the Sacred Heart Hospital at Spokane and are just starting installation. This will be the first isolated plant in Spokane and will be complete and up to date in every particular. It will consist of two 100 h. p. and one 200 h. p. Heine high pressure boilers, with chain grates and stokers; two 90 k. w. and one 45 k. w. d. c. three-wire Westinghouse generator with Ames high speed engines. The refrigerator machinery will be driven by electricity and will include cooling coils on every floor of the hospital.

The Portland Wood Pipe Company began business last May at Portland, Oregon, with one of the largest plants for the manufacture of wood pipe in the country. The new company's plant is already straining its capacity to keep abreast of orders. There is a large and growing demand for this class of pipe among builders of hydraulic power plants and irrigation and water systems. Among recent large shipments made by this company may be mentioned one of 40 carloads of 16-inch pipe to Medford, Oregon, for the city water system and another of 20 carloads to the Union Pacific Railroad for use along the lines in the State of Wyoming. Mr. F. M. Baum, general manager of the new company was formerly manager of the Pacific Coast Pipe Company. While at the head of the latter concern he engineered the pipe line construction of the Great Northern Railroad Cascade tunnel power plant, the largest wood pipe line ever built.

BOOKS RECEIVED.

Steam Power Plant Piping Systems. By William L. Morris: 490 pages, 6x9, 389 illustrations. McGraw Hill Book Company, New York, and The Technical Bookshop, San Francisco. Price, $5.00.

The work systematically deals with the design; installation and maintenance, not only of the pipe, but also of all auxiliary apparatus in the pipe circuit between the boiler and the engine of a high grade steam power installation. As stated in the introductory chapters, the first requisite in pipe work engineering is to so design the plant as to permit repairs without interfering with regular service. The author lays particular stress on the advisability of first laying out the piping system by means of a diagram and the building of the plant around it. The arrangement of the text is logical and in direct accord with the approved practice of considering the condensers and heaters; live steam drips, blow-off and exhaust the piping system by means of a diagram and then building details. The author presents an unusual interesting method of dealing with the latter by assigning the class letters to each detail and then affixing a number to represent a subdivision of that class. This is especially useful in laying out diagrams and insuring careful work. These class letters are assigned respectively to live steam details, exhaust details, both vacuum and atmospheric, boiler feed details, feed and fire pump suction details, heater water and supply details, low pressure details, condenser cooling water details, condensation, air and vacuum line details, pipe for city water for artesian water and for fire service, water treatment apparatus, hydraulic elevator piping details, air line details, steam drip, oil and drip piping, blow-off piping, grease sewer, tile sewer and sundry minor piping details; leaving but four letters of the alphabet unused. The originality and care used in preparation of the text is indicated by the fact that all the illustrations were made from sketches prepared especially for this book, instead of the hodge-podge of manufacturers' drawings that are sometimes found. The book also deals with economic methods of getting the highest efficiency at the lowest cost as determined by a specialist who has given his experience for the benefit of his fellow-workers. It is thus seen to be a book of great practical utility and one indispensable to any engineer interested in design of steam power plants.

NEW CATALOGUES.

Reeves High Class Compound and Single Cylinder Steam Engines are illustrated and described in Bulletin No. 7 from the Trenton Engine Company, Trenton, N. J.

THE COMPENSARC.

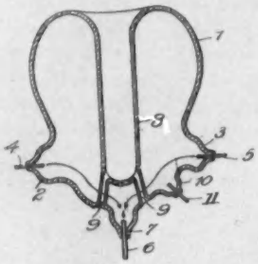
The article on "The Compensarc" in the issue of August 7, 1909, in this journal contained no reference to the manufacturers of this device, the Fort Wayne Electric Works of Fort Wayne, Indiana.

G. M. Barthold, formerly connected with J. K. Gill & Company of Portland and Mr. Barg, of San Francisco, have formed the firm of Barthold & Barg, and have opened offices and salesrooms at 285 Alder street, Portland. The firm will handle engineers' and architects' supplies, exclusively. A complete line of everything pertaining to drawing and surveying will be kept in stock.

The Moran Engineering Company of Seattle, has moved into its new building at 1246 First avenue south. The new building is of reinforced concrete, is 80x150 feet, and has four stories and a basement. The Moran Engineering Company are manufacturing agents and contracting engineers; they represent the leading machinery houses, including the Erie City Iron Works, Deming Co.; American Well Works, Hoppes Co.; Hughston Steam Specialty Co.; Witte Iron Works and Hercules Gas Engine Co.

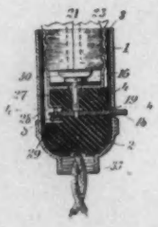
PATENTS

931,906. Rectifier. Charles W. Sirch, Los Angeles, Cal. A rectifier for transforming alternating currents into direct currents, said rectifier being in the form of a glass bulb, anodes extending into said bulb from the sides, a cathode extending upwardly into the bulb from the lower end thereof, a tubular part extending vertically and centrally through the bulb and terminating below the plane of the anodes and



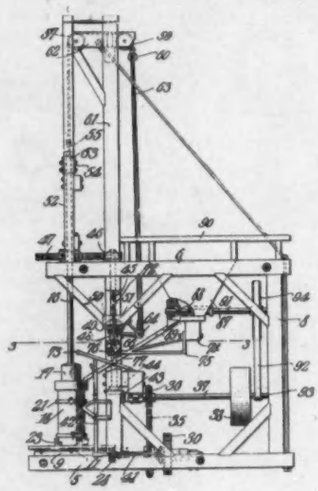
above the cathode, thereby serving to deflect current flow to prevent the current from flowing directly between the anodes, and connections between the lower end of said tube and the lower wall of the bulb, said connections forming passage ways for the atmosphere to the lower end of the tube, the upper end of said tube being also open to the atmosphere whereby air may circulate upwardly through said tube to carry away heat generated by the current flow, said bulb, tube and connections being an integral structure.

932,246. Incandescent Lamp Socket and Switch. Ira L. Cash, Portland, Oregon. An incandescent lamp socket, comprising a shell, an insulating block having a transverse cut and having a recess in the side face thereof, a radially disposed conductor plate having means in said recess for attaching a circuit wire, a switch lever mounted in said cut and



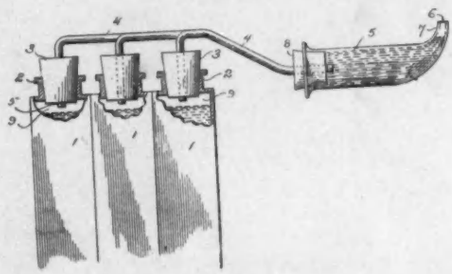
pivotally attached at said conductor plate, said shell having a slot through which said lever projects, a contact plate attached to said block and connected with the other circuit wire, a contact piece carried by said lever adapted to electrically connect said contact plate with said conductor plate, and a socket cup having a tongue near said contact plate cooperating with said contact piece.

931,972. Machine for Making Concrete Pipes. James Thomas, Tacoma, Wash. In a machine of the class described, a supporting frame, a table mounted for rotation on the frame, a core carrying shaft, a core secured to and movable with the shaft, a master gear secured to the core carrying shaft, a vertical shaft having a pinion meshing with the master gear, a winding drum slidably mounted on the vertical shaft, a flexible connection between the core carrying shaft and the winding drum, a clutch for securing the drum to the vertical shaft thereby to operate the same to elevate the core, a driving shaft operatively connected with the vertical shaft, means for transmitting motion to the driving shaft to the table, a hopper, a feeding device disposed within the hopper



for feeding material to the mold, and a connection between the driving shaft and feeding device for operating the latter, said core and mold being mounted for rotation in the same direction and at different rates of speed while the mold and core are held against reciprocation.

932,087. Gas-Controlling Apparatus for Battery-Cells. Oscar D. Apple, Miamisburg, Ohio. As a means of indicating the condition of a battery cell charge, the combination with a battery cell, of a transparent fluid containing reservoir, a



vent pipe leading from the cell and discharging into the reservoir below the fluid level thereof whereby the escape of gas from the cell may be observed in the form of bubbles passing through the fluid within the reservoir and by the frequency of the bubbles adapted to disclose the condition of the cell charge.

931,807. Incandescent Lamp. Edward H. Smith, Aberdeen, Wash. An incandescent lamp, comprising a plug provided with a flange having an indented bridging portion form-

ing a contact, a bulb, a head therefor rotably mounted in said plug, spaced apart contacts carried by said head, and means for limiting the movement of the head relative to the plug.

INDUSTRIAL

CORE LOSS VOLTMETER.

An instrument which makes possible the accurate measurement of the core loss of distributing and power transformers, regardless of wave form distortion or frequency variation, should be a valuable adjunct to a central station's testing department. Such an instrument is the core loss voltmeter manufactured by the Westinghouse Electric & Manufacturing Company.

The correct measurement of transformer losses is perhaps the most difficult and yet the most important test which the central station has to perform. The inaccuracies in such tests result from many causes, such as frequency, temperature and wave form variations, inaccurate wattmeters on low power factors, wrong meter connections, etc. Of all these the wave form variations are the most serious; are almost always present on ordinary commercial circuits and are the most difficult to make corrections for readings taken on ordinary instruments. A peaked voltage wave will cause a lower core loss and a flat wave a higher core loss than a sine wave of the same effective voltage. These variations from a true sine wave may be due to the design of the alternating current generators or to abnormal load conditions and

Core Loss Voltmeter.

voltage drop in the circuit. Such voltage distortions are generally due to high inductance and resistance in the circuit such as the alternator armature, coils of measuring instruments, and the rheostats and choke coils which are often used to regulate the voltage.

Since guarantees of transformer core losses are generally based on a sine wave of electromotive force, it is necessary that some method be employed to secure a sine wave shape or its equivalent, when testing transformers for the performance guaranteed. The equivalent loss due to a sine voltage wave at a normal frequency of, say, 60 cycles, can be secured under normal conditions of wave form and frequency by either lowering or raising the voltage. What is needed then is an indicator which will enable a voltage adjustment to be made to give a core loss equivalent to that produced by a sine wave at normal frequency and voltage. To render such an adjustment possible the core loss voltmeter has been designed.

This meter consists essentially of a ring or core of laminated steel excited by a winding, and a wattmeter of suitable design on which to head the power input to the ring and all copper circuits in the instrument. The core and meter are mounted in suitable cases, as shown in the illustration, and the whole instrument is entirely self-contained and portable. All connections are made inside the instrument and there are but two terminal posts to which line connections are made.

On the laminated core is placed a winding, the core and winding being mounted in the lower case with the two leads of the winding brought through the top and into the instrument case which contains the meter movement. A stationary current coil is connected in series with the winding. The shunt circuit consists of a moving coil, a non-inductive resistance and a compensating coil all in series across the instrument terminals. The compensating coil is wound parallel to the stationary current coil and has the same number of turns. The deflection of the wattmeter movement is caused by the total input of the instrument which consists of the hysteresis and eddy loss in the ring, or magnetic rheostat, and the T^2R losses in the copper circuits of the instrument.

The instrument is calibrated in parallel with an alternating-current volt-meter on a pure sine-voltage wave of the required frequency from a small smooth-core alternator and the scale is drawn in to agree with the alternating current instrument. Two scales are provided—one reading watts input of the instrument itself and the other volts.

In application the core loss voltmeter is connected across the terminals of the transformer under test, in the same manner as an ordinary voltmeter. Wattmeter is also connected in the circuit in such a way as to measure total input of both transformer and core loss voltmeter. The voltage of the circuit is then adjusted by any convenient means until the voltmeter reading is the same as the normal voltage of the transformer. The total power input is then read on the wattmeter and the watt input of the instrument read on the watt-scale of the core loss voltmeter, the difference being the core loss of the transformer.

The core loss voltmeter may be used as a portable voltmeter in testing transformer core losses on any reasonably distorted wave of voltage and without any knowledge of the wave form. The voltage regulation may be secured by the aid of resistance or reactance thus dispensing with the usual multi-voltage transformer and avoiding the inconvenience of varying the field current of the generator. The frequency need only approximate the normal value. The final result of core loss as measured on the wattmeter will be the same value as that which would be obtained on a sine voltage-wave at the normal voltage and frequency of the transformer.

There are many advantages which will result from the use of the core loss voltmeter. Chief among these is the comparative simplicity in testing equipment since very little apparatus is required and no oscillograph is needed to determine the form factor. Another advantage is that transformers need not be tested at the source of power. This is a great convenience when it is desired to measure the core loss in lowering transformers in sub-stations where close voltage regulation except by auxiliary apparatus is difficult to obtain. Competitive tests are also very much simplified when the core loss voltmeter is used because there is no need of having similar conditions of wave form, frequency, etc., for each transformer tested.

The illustration shows the core loss voltmeter as at present constructed. A new style of instrument is being made up which is more compact than the one shown. This new design will have the meter element mounted in the center of the core instead of above it.

GENERAL ELECTRIC COMPANY'S IMPROVED TYPE "H" TRANSFORMER.

Business conditions throughout the country are again assuming normal proportions. The electrical industry has been one of the first to reflect the general improvement, as evidenced by the rapid increase in orders for electrical apparatus.

Central stations are obtaining new customers and the load on these stations is rapidly increasing. Every watt saved in distributing apparatus increases the available power for which is received a definite return. The reduction, therefore, of a few watts in core loss of a transformer means an actual saving in operating expenses.

Annual cost of core loss in transformers is readily determined from the following simple equation:

$$\frac{\text{Watts core loss} \times \text{hours per year (8760)}}{1000 \text{ watts}} \times \text{cost of energy per k. w. hours} = \text{annual cost of core loss.}$$

The improved Type "H" Transformer operates with the exceptionally low core losses shown herewith:
Based on 1100 or 2200 voltes 60-cycles (Sine Wave).

KW.	Core loss.	KW.	Core loss.	KW.	Core loss.
.6	16	4.	40	20.	129
1.	20	5.	45	25.	145
1.5	25	7.5	62	30.	165
2.	29	10.	79	40.	208
2.5	32	15.	103	50.	242
3.	35				

It is an important fact that these low losses have been obtained without sacrificing other important characteristics of the transformers, and are based on a sine wave of electromotive force, in accordance with the rules of the A. I. E. E. Based on an average commercial wave form, these losses would be reduced at least 10 per cent.

Important, also, is the fact that, due to the use of specially alloyed steel for the last five years, the original core loss of the Type "H" Transformer remains practically constant throughout its life. Use the Improved Type "H" Transformer and increase the revenue of the station.

PERKINS BUILDING, SEATTLE.

When Mr. S. A. Perkins of Tacoma contracted for his office building in 1906 he placed the order for the complete installation of power and lighting plant in the hands of Chas. C. Moore & Co., engineers of San Francisco, through their Seattle office. The plant at that time consisted of one Babcock & Wilcox patent safety water tube boiler of the cross drum type; one 75 k. w. Harrisburg side crank high speed engine direct connected to Westinghouse alternator, and one 50 k. w. Harrisburg side crank high speed engine, direct connected to Westinghouse direct current generator, together with necessary switchboards, wiring, auxiliaries, piping, etc. This plant gave such satisfactory results that on starting the addition to his building, which consists of a duplication of that at present installed, contract was again given to Chas. C. Moore & Co., engineers for the power plant extension. This plant is now under construction and is one of several installations which are now being made in the Northwest by Chas. C. Moore & Co., engineers.

This company is also installing a power plant in the Jones Building in Tacoma, condensing apparatus for 2000 k. w. turbine in Yakima, 350 h. p. Babcock & Wilcox boiler in the North Central High School in Spokane, 400 h. p. Babcock & Wilcox boiler for the Seattle-Tacoma Power Company, Seattle piping and auxiliaries for exhaust steam turbine plant for the E. K. Wood Lumber Company in Bellingham, Babcock & Wilcox boilers for the State College of Washington, Pullman, Wash., boilers for the Bremerton & Charleston Light & Fuel Co. at Bremerton and an extension of the power plant of the Home Power Company at Skagway, Alaska.

Much business is reported by this concern in the Northwest and it is apparent that there is a growing desire for isolated power plants in this section of the country.

THE STUDEBAKER ELECTRIC VEHICLE

"The electric pleasure vehicle as manufactured by us is essentially a convenience," says Chester N. Weaver, general manager of the local Studebaker Bros. Company branch, a few days ago. "It is not designed to compete with touring cars or to do 'long distance' running. The matter of obtaining any speed or mileage likely to be desired is solely a matter of design.

"The past history of electric vehicles teems with speed records and long tours," continued Weaver, "but in every case, however, the spectacular results are obtained at very serious sacrifice and expense of convenience and nearly all other desirable qualities.

"As a vehicle for obtaining high speeds or for touring purposes an electric is not to be compared for a moment with the gasoline vehicle designed for that purpose, but for general utility, convenience and economy, no kind of vehicle whatever compares with the so-called 'electric pleasure vehicle' when designed with reference to its own legitimate application.

"In a great many cities these conditions are well recognized. In cities, such as for instance Cleveland, Ohio, where the electric pleasure vehicle is a familiar object, and the care of it well understood, almost every owner of a high-grade car has one or more electrics in his family, and there are many others whose means do not permit them to afford a chauffeur and who are not so situated as to be able to care for their own cars or are not inclined to do so, have also resorted to the electric pleasure vehicle as the means of convenience and economy.

"The real question which confronts the prospective buyer of an electric pleasure vehicle is to get one which is really designed to suit his purpose; that is, the purpose of the electric pleasure vehicle, assuming that he knows what he is buying. A design which compels the purchaser to pay for and carry along with him a power plant and battery vastly in excess of his requirements and in order to meet conditions which might possibly occur once in two or three years, may be attractive as an advertising venture for a manufacturer, but is highly disadvantageous to the purchaser.

"Electric pleasure vehicles have been used and sold in this country for twelve years, and the requirements of design to meet their legitimate uses are well understood and there is no honest reason why a purchaser should be led or compelled for a moment to buy what he does not need.

"In buying a 'Studebaker' the customer can rest assured that he is buying a vehicle which has been designed solely to afford the customer the most economical service in the only application for which such vehicles are suitable, namely as a substitute for legs."

A glass which conducts electricity has been made by E. S. Philips which, while having a conducting power 1,000 times greater than that of ordinary glass, is perfectly transparent, very strong, and as good at resisting atmospheric and gaseous action as most ordinary glasses. Its composition is as follows: Sodium silicate, 83.7 per cent; borax, 13.6 per cent; sodium antimonate, 0.62 per cent; lead oxide, 2:08 per cent. This glass softens at a temperature a little above 932 degrees F. It is highly refractive (being a flint glass), and its co-efficient of heat expansion is somewhat greater than that of ordinary glass, a circumstance which is advantageous in many cases. Threads of this glass are found to form a good substitute for gold leaves in an electroscope.

NEWS NOTES

INCORPORATIONS.

LOS ANGELES.—General Special Electrical Company, capital stock $100,000, by O. A. Hansen and F. T. Broiles.

SAN FRANCISCO, CAL.—American Gas Fixture Company, capital stock $10,000, by J. C., W. W. and James Allen.

LAS VEGAS, NEW MEX.—Cimarron Water Company, capital stock $100,000 by Chas. Springer, F. Whitney and G. E. Remley.

OAKLAND, CAL.—East Oakland Oil Company, capital stock $10,000, by F. H. Senlich, Louis Allgewahr, W. T. Heider, H. S. Knapp and G. L. Warnken.

SALINAS, CAL.—King City Oil Company, capital stock $200,000, by C. H. and F. H. Widemann, W. F. Beasley, W. D. Luckett, H. C., J. B. and Lucile Tully.

SAN FRANCISCO, CAL.—Sierra Pacific Electric Company, capital stock $5000, by C. P. Eells, Hugh Goodfellow, J. S. Eells, 10 shares each; place of business, San Francisco.

LOS ANGELES, CAL.—Long Beach Electrical Manuafacturing Company, capital stock $20,000, subscribed $6010, by T. J. Corbrey, W. H. Tidmarsh, S. F. Estell, J. and C. Gleason.

SAN FRANCISCO, CAL.—Portage Reservoir & Power Company, capital stock $10,000, by Charles W. Hall, Robert C. Harris, W. H. Gibbs, John Heaton, John F. Conley, et al.

SALEM, ORE.—The Baker Interurban Railway Company has been formed by T. B. Newhausen, Anthony Mohr and A. K. Bentley, to construct electric lines in the vicinity of Baker City. The capital stock is $50,000. Electric roads are to be built from Baker City to the smaller towns.

SANTA BARBARA, CAL.—Organization of the Santa Barbara Gas & Electric Company which is to absorb the Merchants Mutual and Edison companies, was perfected when articles of incorporation for the new $1,000,000 company have been filed. Directors who will serve for the first year, in the order named, were C. H. Frink, John F. Diehl and H. R. Weldon of Santa Barbara; S. M. Kennedy of Alhambra; R. H. Ballard, William Dieterle and Herbert F. Keenan of Los Angeles and L. J. Lee and H. J. Bauer of Pasadena. The first three are understood to represent the stockholders of the Mutual company, which was financed by local men, while the Los Angeles and Pasadena directors are associated with the Edison company of Los Angeles, which will hold a controlling interest in the local company. The principal place of business is Santa Barbara. The corporation is to run 50 years. The capital stock of $1,000,000 is to be divided into 10,000 shares of $100 each. There are to be 5000 shares of preferred stock and a like number of common stock. In declaring dividends, the preferred stock is to have a preference of 6 per cent per annum, which is to be cumulative.

TELEPHONE.

POMONA, CAL.—The case of the city of Pomona against the Sunset Telephone Company, involving the right of the city without a franchise will be appealed to the U. S. Supreme Court.

BRIDGEPORT, CAL.—A. S. Bryant, the owner of the Bridgeport telephone line, has taken over the Copper Mountain and Mono Lake line. He now has a crew at work repairing and rebuilding the line.

MARSHFIELD, ORE.—The Kenwell Telephone Company and the Rural Telephone Company have been organized for extensive telephone construction in this territory. A. G. Raab, principal of the North Bend schools, is president of the first named company.

WINNEMUCCA, NEV.—More extensions of the local telephone line are planned by the management of the Utah, Nevada & Idaho Telephone Company. H. L. Thomas, superintendent of the company, who is managing the work, states that in a short time the telephone line will be built to Chafey.

GLENDIVE. MONT.—Contracts have just been closed by the Rocky Mountain Bell Telephone company with the Montana Eastern Telephone Company of Glendive and Paul Van Cleve of Melville, by which Bell telephone service will be extended to incude much additional and important territory in Montana.

NEWBURG, ORE.—The Newburg Telephone Company, independent, of Newburg, is installing a two-position non-multiple central energy common battery plant. The work is being done by the Telephone & Electric Equipment Company, Seattle. This company has completed similar plants at Kelso, Washington, and at Winstock, Washington.

VALLEJO, CAL.—The Pacific States Telegraph & Telephone Company has appropriated $27,000 for the renewal of the toll lines in the Napa and Vaca valleys. The sum of $13,500 is to be spent in rebuilding the lines from the bay northward to Calistoga, while an equal sum will be used to erect three new cables between Vacaville and Sacramento.

SAN FRANCISCO, CAL.—A decision favorable to the Western Union Telegraph Company in its lawsuit with the Postal Telegraph Company and the Commercial Pacific Company has been rendered by Judge Seawell. The court held that the extra charge of about $5 a message imposed by the Commercial upon messages handed to it by the Western Union for transmission to Asiatic points was discriminatory. He continued in force an injunction granted early in the year preventing the imposition of the extra charge.

TRAANSMISSION.

MONTEREY, MEX.—The Guadaloupe de Los Reyes Mining Company of Sinola will build a power plant on the Southern Pacific road and transmit electricity to the mine.

SPOKANE, WASH.—The Washington Water Power Company has secured valuable water rights on the north bank of the Spokane river in Stevens county. It is understood if the company's engineers report favorably the property will be developed at an early date.

SEATTLE, WASH.—The Seattle-Tacoma Power Company is increasing its transmission from Snoqualaine Falls to Seattle from 30,000 to 60,000 volts. The company recently ordered from the Northwest Supply Company, Pittsburg, 2500 large insulators in addition to the original order of 15,000.

NEVADA CITY, CAL.—It is believed that the Yuba Power and Hydro-Electric Company will purchase electric power pending the construction of its works and carry the current into the Alleghany District. A report announces that by November, or before, a pole line will be supplying power to upper Nevada county and lower Sierra county mines.

GOLDFIELD, NEV.—During the last week the Walker River Power Company has placed surveyors in the Lucky Boy district to locate reservoir sites, between Bridgeport, Cal., and Sweetwater, Nev. Two sites have been selected, which will send water back four miles. The purpose is to furnish light and power for all districts around Lucky Boy.

ILLUMINATION.

CHEWELAH, WASH.—The City of Chewalah is enlarging the municipal lighting plant, having added an engine and generator.

TACOMA, WASH.—A recent fire in the Tacoma Gas Light Company burned away the roof of the building and destroyed a portion of the floor.

PASADENA, CAL.—The city lighting department has been granted permission by the City Council to purchase electrical supplies costing $1000.

TROPICO, CAL.—A lighting district composed of part of North Glendale, West Glendale and a part of Tropico was unanimously favored at the polls last week.

HIGHLAND, CAL.—A special election was held here last week for the purpose of submitting the question of establishing a lighting district to the voters. The proposition carried.

PASADENA, CAL.—The Pasadena branch of the Los Angeles Consolidated Gas Company are now taking orders for gas in Altadena, the company having decided to extend its mains north from Los Robles avenue at once.

LOS ANGELES, CAL.—The Board of Public Works will receive sealed bids for furnishing the city with one 2-drum electric hoist in accordance with specifications No. 93 on file with said board. Certified check must be 5 per cent of amount bid.

LOS ANGELES, CAL.—Sealed bids are being received by the Board of Supervisors for furnishing the city ten thousand 16-candlepower incandescent lamps in accordance with specifications No. 97. Certified check must be 5 per cent of the amount of bid.

COLMA, CAL.—An election will soon be held in Colma Lighting District, San Mateo county, for the purpose of voting on the subject of organizing and forming a highway lighting district, for installing and maintaining a system of street lights in Colma.

OAKLAND, CAL.—The voters of Fruitvale established a new lighting district Saturday when they cast 125 votes for and 48 votes against the proposition. The new district is north of East Fourteenth street, east of the Oakland boundary to Redwood road and the Melrose line.

EUGENE, ORE.—Oscar Millican has been awarded $5500 for the rights of way through his farm for the city's electric power canal. The city will now proceed with the construction of the canal through the Millican farm and is expected to have the power plant completed early next year.

BURBANK, WASH.—Burbank Power & Water Company, incorporated recently, has taken over the Pasco Power & Water Company. Jas. L. Hage is president; Jacob Furth, vice-president; C. E. Farnsworth, secretary and treasurer, and E. M. Chandler, general manager and chief engineer. The hydraulic plant now developes 1100 horsepower which is used for pumping water for irrigation. The plant will be gradually increased until all the available power, 16,000 horsepower, is developed. They now have water on 13,000 acres; additional power will be used to irrigate more land and furnish power and light to Kennewich, Pasco, Burbank, etc.

BAKERSFIELD, CAL.—J. F. Stratton, vice-president and general manager of the West Side Electric Company, which was recently granted a franchise by the Supervisors in the West Side oil fields has gone to Maricopa, where he will immediately begin the construction of the plant that is to generate electricity for power and light for the field. The main plant will be located on the lease of the Sunset Rex Company, near Maricopa, and the first equipment will be 450 horsepower. Work on the foundation will begin at once and the machinery, which has been ordered from the Western Gas Engine Company, will be installed as soon as it arrives here. By October 15th, it is hoped, it will be supplying the town of Maricopa with electric lights and the lines will be extended to Midway and McKittrick, as soon as possible thereafter. Machinery to develop 900 horsepower in addition to the first plant, has been contracted for and will be installed as rapidly as possible.

SONORA, CAL.—The Tuolumne Power & Light Company is reported to be about to absorb the holdings of the Tuolumne River Company consisting of water rights and reservoir sites on the South and Middle Forks of the Tuolumne river, a series of ditches in the Big Oak Flat and Groveland districts and a considerable area of timber and mining land, all of which has been since 1906 under the superintendency of Lester R. Wiley. The present holdings of the Tuolumne Power & Light Company, include various water and land rights on the Middle and South Forks. Among the leading spirits of this company are John Hays Hammond, E. A. Wiltsee, John C. Hays.

TRANSPORTATION.

TACOMA, WASH.—The Tacoma Railway & Power Company is putting in Pay-as-you-enter cars.

RENO, NEV.—It is announced that the Reno Traction Company is planning to build an extension of its track from Fourth street to the Fair grounds.

SANTA BARBARA, CAL.—The City Council has granted the Santa Barbara Consolidated Railway Company, a franchise to extend its Oak Park line from Fourth to Castillo street to the park.

MAYFIELD, CAL.—The trustees have passed an ordinance granting the Peninsula Railway Company a franchise to construct and operate a single track or double standard gauge electric railroad.

CLAREMONT, CAL.—The Claremont City Trustees have granted to the Ontario and San Antonio Heights Railway Company, a franchise to lay tracks and operate electric cars on certain streets of the town.

MONTEREY, CAL.—The broad-gauging of its entire system, five new cars, a new electric distributing system for Pacific Grove, a new electric transmitting system to Salinas and a new office building in Pacific Grove are improvements under way and planned by the Monterey County Gas & Electric Company.

SAN JOSE, CAL.—The Peninsula Railroad Company, which some months ago paid the city $11,000 for a broad-gauge franchise covering the narrow gauge lines operated in this city by the San Jose Railway Company, has begun the work of laying broad gauge ties and rails over the line at Seventh and Keyes streets.

VISALIA, CAL.—The matter of the extension of the Visalia Electric Railroad from Lemon Cove to Three Rivers has again been taken up. The railroad asks for free rights of way. The extension of the road to Red Banks through Narajo and to Woodlake is progressing rapidly. The grading is near Bravo Lake and rails are being laid. Cars will be running before winter. The new line is some 15 miles in length.

LOS ANGELES, CAL.—J. M. Neeland, G. A. Atwood and M. N. Newmark are at the head of a syndicate of capitalists which has just concluded large land purchases in the Yucaipa Valley. The syndicate will construct and operate an electric railroad from Redlands to Yucaipa City townsite, a distance of nine miles, with a branch to Oak Glen. Eventually, the line will be extended to San Jacinto and Hemet, there connecting with a network of railroads planned for San Diego county. Construction on the railroad will begin within 60 days.